CS 122 Fall 2010 HW 4, Due Wed. Oct. 27

1. Dijkstra's algorithm is designed for graphs with non-negative edge weights. Does it work with negative edge weights? If no, given an example. If yes, give a proof.

2. Solve problem 5 on p. 190 of the text.

3. Is it true that when all of the edge weights in a graph G are distinct and positive, that the minimum spanning tree is unique? Explain. Use result 4.17 (page 145) from the book.

4. Suppose that the edge weights in graph G are not all distinct, so some edge weights appear more than once. Is the conclusion of result 4.17 still true? If no, give an example, and if yes, give a proof.

5. Now prove that when the edge weights in G are not all distinct and edge e is the minimum weight edge across a partition $(S, V - S)$ of the nodes of G, then *some* minimum spanning tree of G contains e. This can be done by an edge-exchange kind of argument, similar to the proof of 4.17.